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EFFECT OF ADDING POLYMER AND SUGAR IN COMPRESSIVE STRENGTH OF THE CONCRETE

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A B S T R A C T

Almost all civil engineering works are site work-based but concreting in hot weather Le above 100°F accelerates the early hydration of cement and produces concrete having high strength at an early age. but the later strength is reduced considerably. Further, the rapid evaporation of water causes plastic shrinkage in concrete and subsequent cooling would cause tensile stresses and crack Hence to maintain the standard condition, admixtures are used. Retarders are admixtures that extend the hydration induction period, thereby increasing the setting times. Sugar is a carbohydrate, a substance composed of carbon, oxygen, and hydrogen. It can be useful when concrete is used in hot weather when the normal setting time of concrete is shortened by the higher surrounding temperature such as in Gujarat, Rajasthan, etc. Very small dosage of the under 0.06 percent of sugar can delay the initial setting time by about 45 minutes 45 seconds.

Keywords*: Polymer And Sugar, Compressive strength, polymer concrete.*

1. INTRODUCTION

The worldwide demand for high-performance cement-based materials has tremendously increased during the last few decades. Economical and environmental considerations had a crucial role in supplementary cementing material usage as well as better engineering and performance properties. The improvement of concrete properties identifies high-performance concrete, theological characteristics, and durability. Cement-based materials are dominant structural materials for civil infrastructure. The addition of a minor amount of polymer to a cement mix can significantly change the properties of the resulting material, which is known as a polymer-modified cement-based material. These additives, known as admixtures, can be in the form of polymer particles, short polymer fibers, or liquids. Fibers are in general more effective than particles for toughening the cement-based material, but they are more expensive. Low cost is critical to the practical viability of a cement-based material.

The use of admixtures is a relatively convenient way of improving the properties of cement-based materials. Techniques involving special mixing, casting, or curing procedures tend to be less attractive, due to the need for special equipment in the field, although other admixtures are also available like latex and short fibers, which are more expensive. Cement; is a powder of alumina, silica, lime, iron oxide, and magnesium oxide burned together in a kiln, finely pulverized, and used as an ingredient in mortar and concrete. Concrete is made by mixing a cementing material, mineral aggregate (such as sand and gravel) with sufficient water to cause the cement to set and bind the entire mass. Portland cement, as defined by the European Standard EN197.1 is a clinker with a two-thirds mass of calcium silicates ($3CaO.SiO_2$ and $2CaO.SiO_2$) and the rest is aluminum and iron-containing clinker phases. The ratio of CaO to SiO_2 shall not be less than 2.0. The magnesium content (MgO) shall not exceed 5.0% by mass. There are different standards for the classification of Portland cement.

2. OBJECTIVE

1) Sugar is used as a retarder for a concrete mix.
2) Sugar is more advisable to use a commercial admixture with known properties supplied by a reputable procedure.
3) Mixing plain white sugar in concrete prevents the cement from joining with the water and slows the hardening of the minerals.
4) Sugar-based solutions are sometimes added to the mixture when workers need to keep concrete moist.
5) The addition of a minor amount of polymer to a cement mix can significantly change the properties of the resulting material, which is known as a polymer-modified cement-based material.

6) The use of admixtures is a relatively convenient way of improving the properties of cement-based materials.

7) Polymer concrete does not produce bleed water.

3. EXPERIMENTAL SETUP AND METHODOLOGY

Materials:

1) **Cement:** Portland cement is a hydraulic cement that hardens in water to form a water-resistant compound. The hydration products act as a binder to hold the aggregates together to form concrete.

2) **Natural Sand:-** Natural sand was utilized as a cementitious material obtained from the local market.

3) **Coarse:** aggregate consists of naturally occurring stones (crushed, uncrushed, or broken). It should be hard, strong, dense, durable, and clean.

4) **Water:** The water used in the manufacture of concrete masonry units shall be free from matter harmful to concrete or drinking water should be used to provide adequate strength and generally the water-cement ratio is taken 1:3 in whole experiments.

5) **Admixture:**

a) **Sugar:-** Sugar was used in concrete production. A white crystalline solid is easily soluble in water and easily available on market and used in experimental works. Sugar was added to the concrete mix with three different dosages as 1.0% by weight of cement.

b) **Synthetic polymer:-** Portland cement was obtained from Maple Leaf Pakistan Ltd. Fineness of cement used was determined by sieving the cement from BS mesh number 170 test sieves and recording the residue which shall not exceed 10% for OPC cement when calculated by weight to the original weight of the cement. To investigate the effects of different polymers on the performance properties of concrete 10 and 20% polymer addition in concrete mixtures were employed. The control mix contained only Portland cement as the binder.

4. METHODOLOGY

1. **Hand mixing:** we take the ratio of 3:6:12 for making concrete respectively cement: sand: aggregate. First, dry mix the materials and then add a suitable proportion of water.

Fig; Mixing of concrete

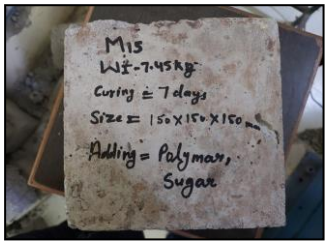
2. **Admixtures:** After mixing the material add admixtures, 30g polymer and 30g sugar for testing the compressive strength of concrete and mix it properly

Fig; admixtures.

3. **Mould filling:** after mixing the materials fill 3 cubes of dimensions 15cm x 15cm x 15cm. We have filled the mold in 3 layers giving 30 blows in every layer. Vibration is given to the molds for removing air voids from the concrete.

Fig; Mould filling.

4. **Setting Time:** we let the molds for 24 hours and then cure them for 7 days.



Fig; setting of concrete.

5. **Compressive Strength:** Compressive strength measurements were conducted using a compression testing machine according to the ASTM C150 standard. The compressive strength was calculated from the crushing load and the area over which the load is applied. The average compressive strength of the three mortar cubes, prepared, stored, and tested by the ASTM standard procedure for ordinary Portland cement should not be less than 154 Kg/sq.cm and 239 kg/sq.cm for 3 days and 7 days respectively.

Fig; compressive strength check of block.

Calculations:

The values we recorded for 3 molds in compressing machine are

For the 1st cube 397kn

For the 2nd cube 352kn

For the 3rd cube 298kn

By applying formula

$$P = L/A$$

P = Pressure

L = Load

A = Area of the cube

We have now the values as

For the 1st cube 17.6 KN/mm^2

For the 2nd cube 15.6 KN/mm^2

For the 3rd cube 13.2 KN/mm^2

Fig; load applied in the block.

5. RESULTS

As compared to ordinary block of concrete when we added the admixtures the compressive strength of the concrete block increased.

6. CONCLUSIONS

- Polymer addition decreased the initial and final setting times of concrete paste as compared with the paste of standard consistency. Natural latex addition decreased the setting time remarkably to a very low extent in comparison to acrylic resin and polyurethane addition. With the addition of acrylic resin and polyurethane setting times decreased but the difference was smaller than the setting time of cement mixture of standard consistency. By adding a 10% quantity of Polyurethane, the initial setting time and final setting time decrease to some extent but a further increase in its quantity causes an increase in the setting time.

- Generally, there was a systematic decrease in compressive strengths with the increase in polymer contents, especially for natural latex. The incorporation of 20% polymer addition in concrete caused a decrease in compressive strengths further than the addition of 10% polymer addition.

- On average natural latex,, addition show a remarkable change in the properties of cement mixture than the addition of other polymers. Initial and final setting times is decreased thus setting the cement quickly instead of taking a long time to settle.

REFERENCE

[1] E. Badogiannis, V. G. Papadakis, E. Chaniotakis, S. Tsivilis; Exploitation of poor Greek kaolins: strength development of metakaolin concrete and evaluation by means of k-value. Cem Concr Res 34:1035–1041, 2004.

[2] A. A. Ramezanianpour, V. M. Malhotra; Effect of curing on the compressive strength, resistance to chloride ion penetration and porosity of concretes incorporating slag, fly ash, or silica fume. Cem Concr Compos 17:125–133; 1995.

[3] Y. Malier;High Performance Concrete from Materials to Structure',1st English Language edn (E & FN Spon, Cambridge), 1994.

[4] O. Yoshihik ; Cem.Concr. Compos. 20(2/3)189, 1998.

[5] M. D. Luther and P. A. Smith; in Proc. Eng. Foundation. Conf.,P.75,1991.

[6] V. M. Malhotra, Concrete International: Design & Construction,P.15,4,23, 1993.

[7] M. D. Luther, IBID. 15(4)29 ,1993.

[8] J .Wolsiefer and D. R. Morgan, IBID. 15(4)34, 1993.

[9] A.F. Holleman; E. Wiberg. "Inorganic Chemistry" Academic Press: San Diego, 2001. ISBN 0-12-352651-5 Pakistan cement company limited.2001.

[10] Mineral Commodity Summaries; Bureau of Mines, U.S. Department of the Interior,Washington, DC, 1993.

[11] R.J. Collins. and S.K. Ciesielski; Recycling and Use of Waste Materials and ByProducts in Highway Construction. National Cooperative Highway Research Program Synthesis of Highway Practice 199, Transportation Research Board, Washington, DC, 1994.

[12] P. C. Hewlett (Ed); Lea's Chemistry of Cement and Concrete: 4thEd, Chapter 1, 1998.

[13] V. S. Dubovoy, and J.W. Ribar; Masonry Cement Mortars-A Laboratory Investigation, Research and Development Bulletin RD095, PCA, Skokie, IL, 26pp. 1990.

[14] J.I. Davison “Effect of Air Entrainment on Durability of Cement-Lime Mortars,” Durability of Building Materials, Elsevier Publishing Co., Amsterdam, 1981. 63.

[15] M. U. K. Afridi, Y. Ohama, K. Demura and M. Z.Iqbal ,Cem.Concr.Res.33(11)1715, 2003.

[16] S.A. Rizwan and K. Ahmad in Proc.First Int. Conf. on Concrete and Development C and D 1 P. 521,2001.

[17] K. N. Rahal and M. El-Hawary, ACI Struct. J. 99(6)811, 2002.

[18] S.G. Chu, T.J. Podlas and T.S. Young, ASTM Special Tech. Pub. 1356 , 1999.

[19] P. Soroushian, A. Khan and J. Hsu, ACI Mater. J. 89(6)535, 1992.

[20] P. Soroushian, A. Tilili, A. Alhozaimy and A.Khjan, IBID.90(2) 182,1993.

[21] P.W. Chen and D. D. L. CHUNG, IBID. 93(2) 129, 1996.

[22] P.W. Chen, X. Fu and D. D. L. Chung, IBID. 94(2)147, 1997.

[23] X. Fu, X. Li and D. D. L. Chung, J. Mater. Sci. 33 3601, 1998.